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Under the Pteropsida are grouped the classes Filicales, Pteridospermeae, and Gymnospermeae, the two latter being regarded as of coordinate importance and constituting the Paleozoic Spermatophyta. The author in his discussion of the Filicales makes a strong stand against the tendency to include all paleozoic filicoid plants in the Pteridospermae. He points out that there is clear evidence that the Botryopterideae of RENAULT were true ferns. This is likewise in all probability true of other apparent filicinean remains, of unresolved affinity, characterized by the presence of annulate sporangia, for which the author proposes the form-generic name *Pteridotheca*. There is further good evidence in fruiting fronds referred to *Ptychocarpus*, *Asterotheca*, etc., with synangial sporangia resembling those of existing Marattiaceae, as well as in stems presenting the anatomical structure of *Psaronius*, for the existence of ferns like the Marattiaceae in paleozoic times.

The paleozoic seed-plants are included under two coordinate classes: the Pteridosperm(e)ae and Gymnosperm(e)ae, which are spelled with an unusual and perhaps superfluous *e*. The description of the Pteridospermae (Cycadofilices of PORONÉ) contains little which is not to be found in the author's lecture before the Vienna Congress. He states very clearly however his reasons for regarding the Pteridospermae as a group coordinate with the remaining gymnosperms as at present recognized: (1) the mega- and microsporangiate sporophylls were little modified from ordinary vegetative fronds; (2) the anatomical structure was more clearly fern-like than that found in any other gymnosperms. It may well be objected, however, that the Pteridospermae were essentially gymnosperms, that the Cycadophyta, taken as a group, present equally fern-like mega- and microsporophylls, and that the anatomical peculiarities of the Pteridospermae can nearly all be duplicated in the lower Gymnospermae. Whether or not the Pteridospermae stand as a distinct class coordinate with the remaining Gymnospermae, there can be no question that their discovery constitutes the principal advance in many years in our knowledge of the Spermatophyta. All botanists must be grateful to the author for his lucid and interesting account of paleozoic plants, which he has done so much to restore and rescue from oblivion. In looking over these pages, one is tempted to call the article an original compilation, so large and important, albeit not in any way disproportionate, a part, do the author's own investigations make of the whole.—E. C. JEFFREY.

Cytological studies on the Cyanophyceae.—Two contributions^{15, 16} on the cytology of the Cyanophyceae have recently appeared, which add a few new features to an already much confused subject. GARDNER regards as the chief trouble which has obscured the truth for former investigators their "failure to discover a method which would clearly, definitely, and unmistakably differen-

¹⁵ GARDNER, N. L., Cytological studies in Cyanophyceae. Univ. Calif. Pub. Bot. 2:237-96. pls. 21-26. 1906.

¹⁶ GUILLIERMOND, A., Contribution à l'étude cytologique des Cyanophycées. Rev. Gén. Bot. 18:392-408, 447-65. pls. 9-13. 1906.

tiate the structures which are present." He has discovered that material treated with a strong solution of iodine; then washed with 95 per cent. alcohol; finally placed in water and pressed upon and rolled under a cover glass gives preparations "in many ways superior to microtome sections." Hence the many colored figures which accompany his paper are all drawn from optical cross or longitudinal sections rather than from microtome sections. Such a method appears to the reviewer entirely inadequate to solve the difficult problems pertaining to the cells of the Cyanophyceae.

The central body, which is regarded by GARDNER as a nucleus, consists of a thread-like structure composed of chromatin (as evidenced by staining reactions); a ground substance (not differentiated in his drawings); and " α -granules" (the slime globules of former authors). The ground substance acts, in his opinion, simply as a matrix for the chromatin elements and plays no essential rôle in nuclear division; as to whether this is achromatin or not, the author withholds judgment. Three types of nuclei are distinguished: (1) the diffuse type, which is characteristic of most of the fifty forms examined; (2) the net-karyosome type, found only in *Dermocarpa*—which presents a new kind of nuclear division, in that a large nucleus is represented as breaking up simultaneously into a large number of daughter nuclei; and (3) the primitive mitosis type, found likewise in one species only. The nuclei of types 1 and 2 divide by simple amitosis; while in type 3 the breaking up of the chromatic thread into three long parallel segments is regarded as a step toward mitosis.

GARDNER finds no special chromatophore. The first product of assimilation, in his opinion, is grape sugar, some of which is converted into glycogen and thus stored. He adds some interesting experiments on the effects of various changes of habitat, such as from salt water to fresh and to distilled water, alternate drying and submergence in water, the effect of prolonged darkness, etc. He finds that such changes do not produce any marked change in cytological characters.

GUILLIERMOND, who also apparently used no sections in his study, is in general agreement with GARDNER's conclusions. He prefers, however, to regard the central body as a sort of nucleus reduced to the state of a "chromidial" network. It is in reality "*un noyau sans membrane*" (a conclusion which nearly all other investigators who accept the nuclear nature of the central body have held before him). GUILLIERMOND comes to one conclusion, however, which is apparently new, namely that there are present in the central body two kinds of granules, whereas GARDNER as well as most other investigators have distinguished only one. The one or two large, conspicuous granules of the central body GUILLIERMOND refers to the nucleolus-like bodies of A. MEYER (in my opinion the so-called slime globules). Besides these, he distinguishes the meta-chromatic granules; smaller numerous granules which he regards as corresponding to the slime globules (PALLA), or red granules (BÜTSCHLI), or anabaenin granules (FISCHER), or volutin granules (MEYER). Their appearance in some of his drawings suggests, however, what have been called by the reviewer, in a paper on the subject, chromatin granules. It seems likely, in fact, that GUIL-

LIERMOND, at least in some of his drawings, has combined in his metachromatic bodies two distinct kinds of granulations, namely, chromatin granules and slime globules.—EDGAR W. OLIVE.

Papers on algae.—The following papers on algae appear in the volume of papers issued by the students of Dr. F. R. KJELLMAN in honor of his sixtieth birthday.

BORGE¹⁷ lists forty-six species (mostly desmids) of fresh-water Chlorophyceae, of which several are new to science, from collections made by Dr. P. DUSÉN in Magellan Ter. in 1896, and in Tierra del Fuego Ter. and Desolation Island in 1906. He also enumerates 77 species, comprising all the fresh-water Chlorophyceae known at the present time from the islands south of Magellan Strait.

KYLIN¹⁸ describes and figures four species of Chantrelaria, three of which are new to science.

SVEDELIUS¹⁹ made a thorough study of the Ceylon reef vegetation at Point de Galle in the year 1902-03; first at the time of the winter or northeast monsoon (November-March) and later at the time of the summer or southwest monsoon (August). His observations were carried on with a view to establishing the existence of a periodicity in the marine vegetation of this region, and to showing how this was manifested and from what it resulted. He found that there is an undoubted antagonism between living coral and algal growth. Only certain calcareous algae and forms with creeping rhizomes, such as *Caulerpa clavijera*, can survive. Algal life was richest upon dead coral ledges and exposed rocks. The Florideae unquestionably dominate the vegetation of the littoral region at Point de Galle. The color of these forms is peculiar, being dark violet, gray-brown, or gray-green, instead of red or purple. It was proved that a marked periodicity prevails in the littoral algal flora on the coast of Ceylon. Certain species occur only at a certain time during the year, and their period of development is extremely limited. The chief mass of vegetation is made up of perennial species which live throughout the year; of these many produce fruit only during a certain time. Some species show no indication of periodicity, but appear the same at all times of the year. It was established that the periodicity depends upon the change of monsoon (*Monsoonwechsel*), but the exact causes for this are not yet made clear. Apparently the condition of the water (temperature, salinity, amount of agitation), as influenced by the monsoon, might have considerable effect upon the periodicity.

SKOTTSBERG²⁰ accompanied the Swedish Antarctic Expedition and was in

¹⁷ BORGE, O., Süßwasser-Chlorophyceen von Feuerland und Isla Desolacion. Botaniska Studier, tillägnade F. R. KJELLMAN, 21-34. *pl.* 2. *figs.* 5. 1

¹⁸ KYLIN, HARALD, Zur Kenntnis einigen schwedischen Chantrelaria-Arten. *Op. cit.* 113-26. *figs.* 9.

¹⁹ SVEDELIUS, NILS, Ueber die Algenvegetation eines ceylonischen Korallenriffes mit besonderer Rücksicht auf ihre Periodizität. *Op. cit.* 184-221. *pl.* 6. *figs.* 10.

²⁰ SKOTTSBERG, CARL, Observations on the vegetation of the antarctic sea. *Op. cit.* 245-64. *pls.* 7-9.